

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 7,307,999 B1
APPLICATION NO. : 10/058442
DATED : December 11, 2007
INVENTOR(S) : Donaghey

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It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

The title page showing an illustrative figure, should be **Deleted** and substitute therefore the attached title page

Delete drawing sheets 1 through 5 and substitute therefore the drawing sheets consisting of figs. 1-7 as shown on the attached page

Signed and Sealed this

Twenty-sixth Day of August, 2008

A handwritten signature in black ink, reading "Jon W. Dudas". The signature is stylized, with a large, looped initial "J" and a cursive "Dudas".

JON W. DUDAS
Director of the United States Patent and Trademark Office

(12) **United States Patent**
Donaghey

(10) Patent No.: **US 7,307,999 B1**
(45) Date of Patent: **Dec. 11, 2007**

(54) **SYSTEMS AND METHODS THAT IDENTIFY NORMAL TRAFFIC DURING NETWORK ATTACKS**

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(75) Inventor: **Robert J. Donaghey, Lexington, MA (US)**

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(73) Assignee: **BBN Technologies Corp., Cambridge, MA (US)**

Glave, James, "Smurfing Cripples ISPs," Wired News, www.wired.com, 4 pages, Jan. 7, 1998.

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 1074 days.

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(21) Appl. No.: 10/058,442

(Continued)

(22) Filed: Jan. 28, 2002

Related U.S. Application Data

(60) Provisional application No. 60/269,547, filed on Feb. 16, 2001.

Primary Examiner—Edan Orgad

Assistant Examiner—Robert W. Wilson

(74) Attorney, Agent, or Firm—Ropes & Gray LLP

(51) Int. Cl.
H04J 3/16 (2006.01)

(52) U.S. Cl. 370/465; 370/389; 726/23

(58) Field of Classification Search 370/235, 370/252, 238, 410, 432, 401; 709/224, 240; 713/201, 162

See application file for complete search history.

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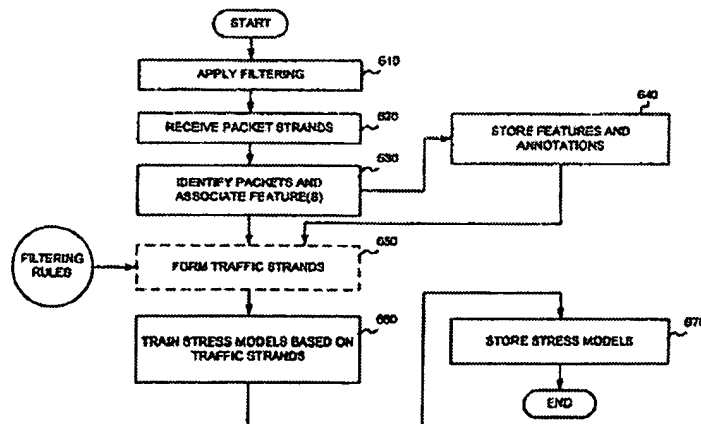
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(57) **ABSTRACT**

A system protects against loss of communication during network attacks. In a first implementation, a system (120) models the behavior of normal users in a network in response to an application of a first packet filtering technique. The system (120) receives a group of packets from a first user subsequent to the application of the first packet filtering technique and creates one or more models reflecting the behavior of the first user based on the received packets. In another implementation, a system (130) receives a stream of packets subsequent to a filtering technique being applied, partitions the packets into groups, where each group corresponds to more than one packet, and classifies each group of packets as a normal group or an attack group using one or more models. Each model reflects a normal response to an application of the filtering technique. The system (130) forwards groups classified as normal groups, thus preventing network attacks from choking off all communication in the network.

17 Claims, 7 Drawing Sheets



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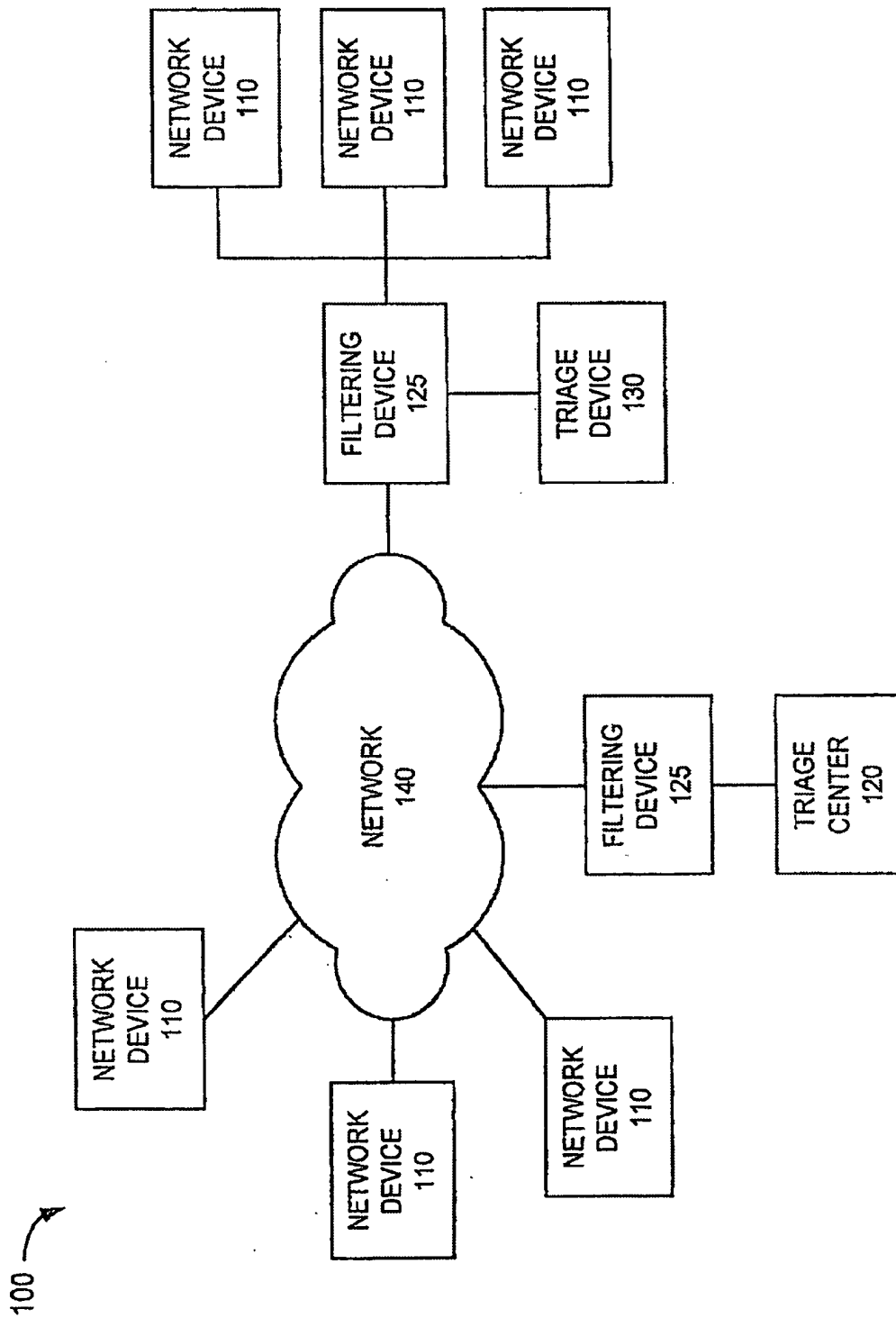


FIG. 1

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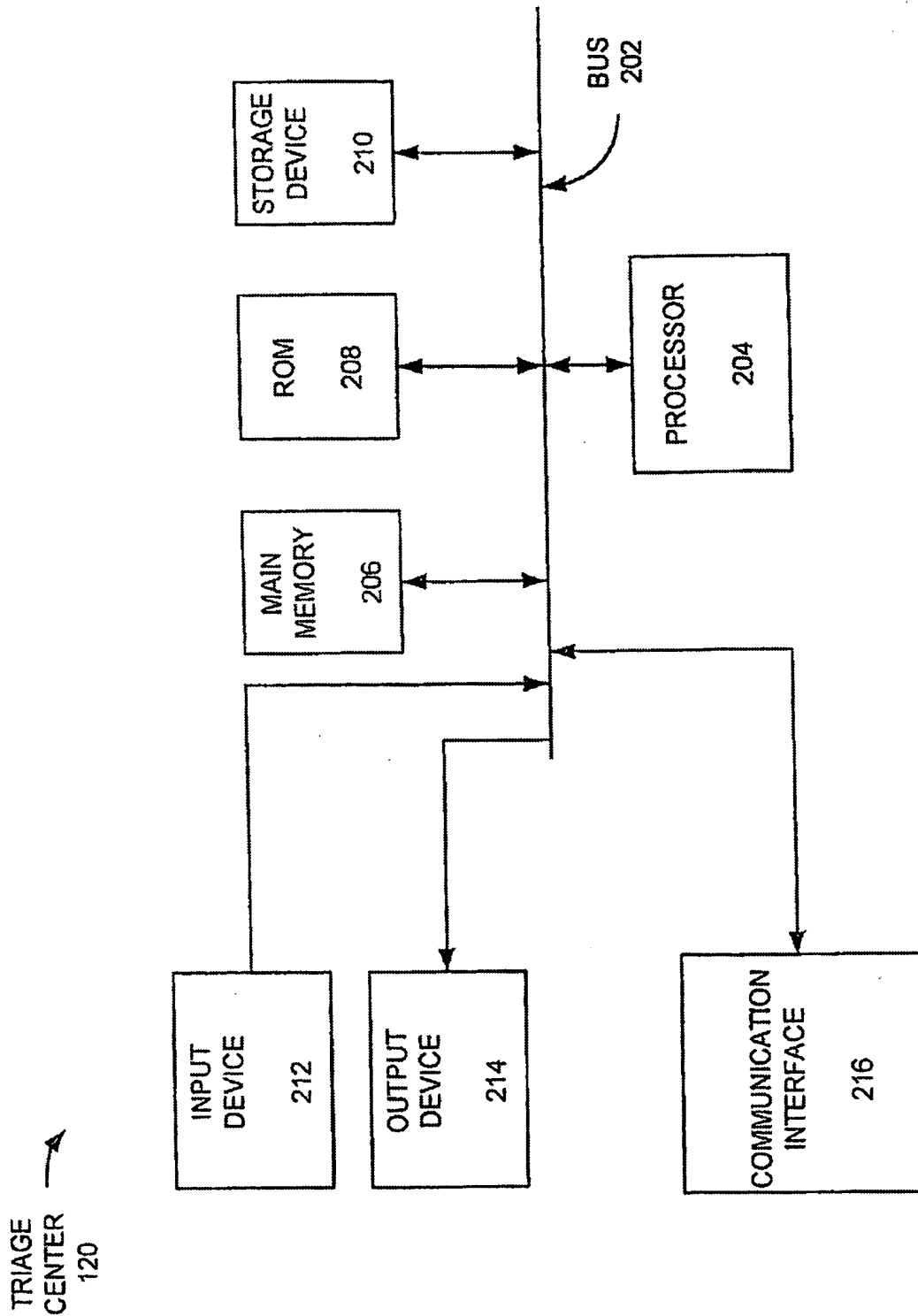


FIG. 2

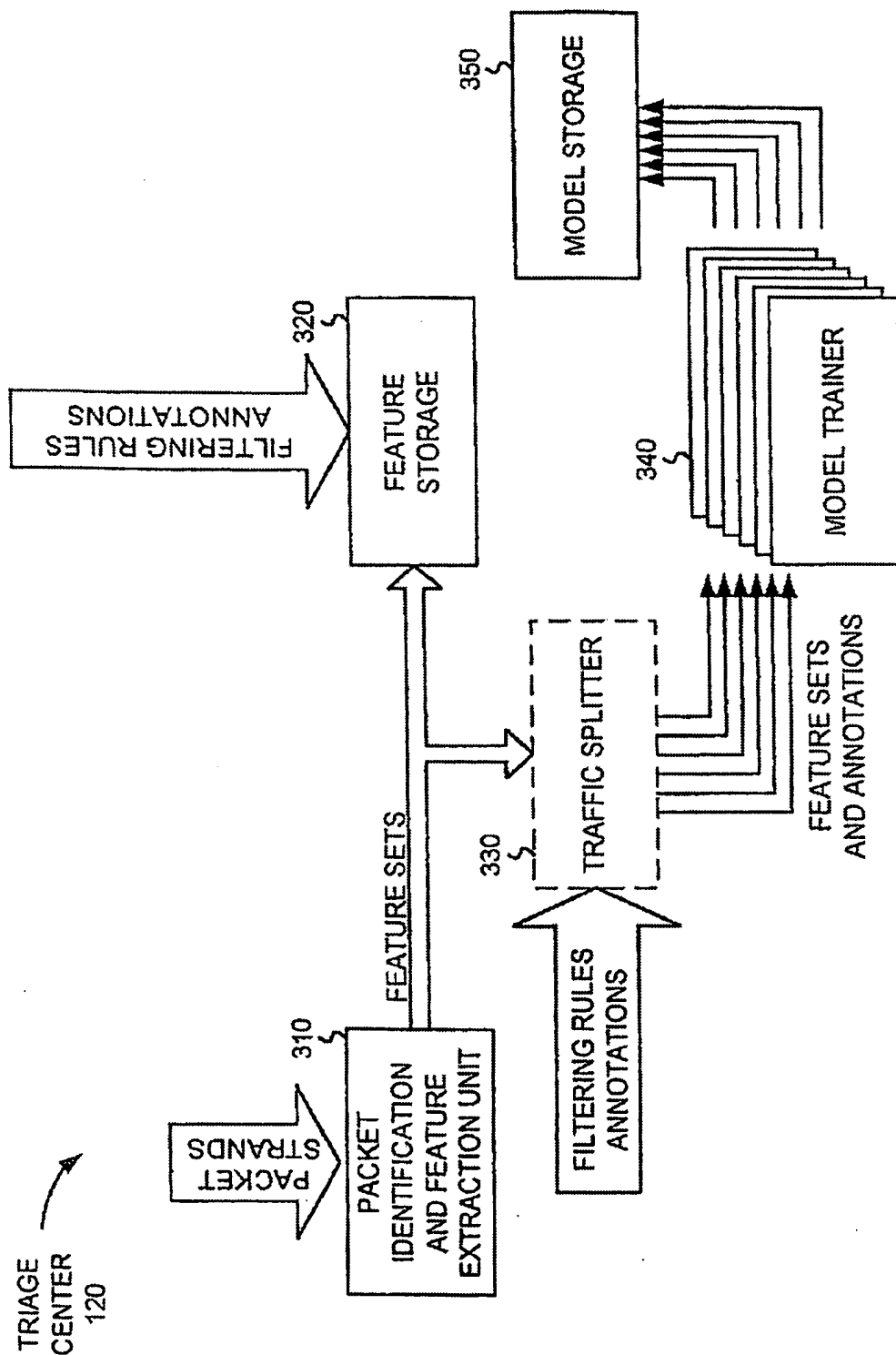


FIG. 3

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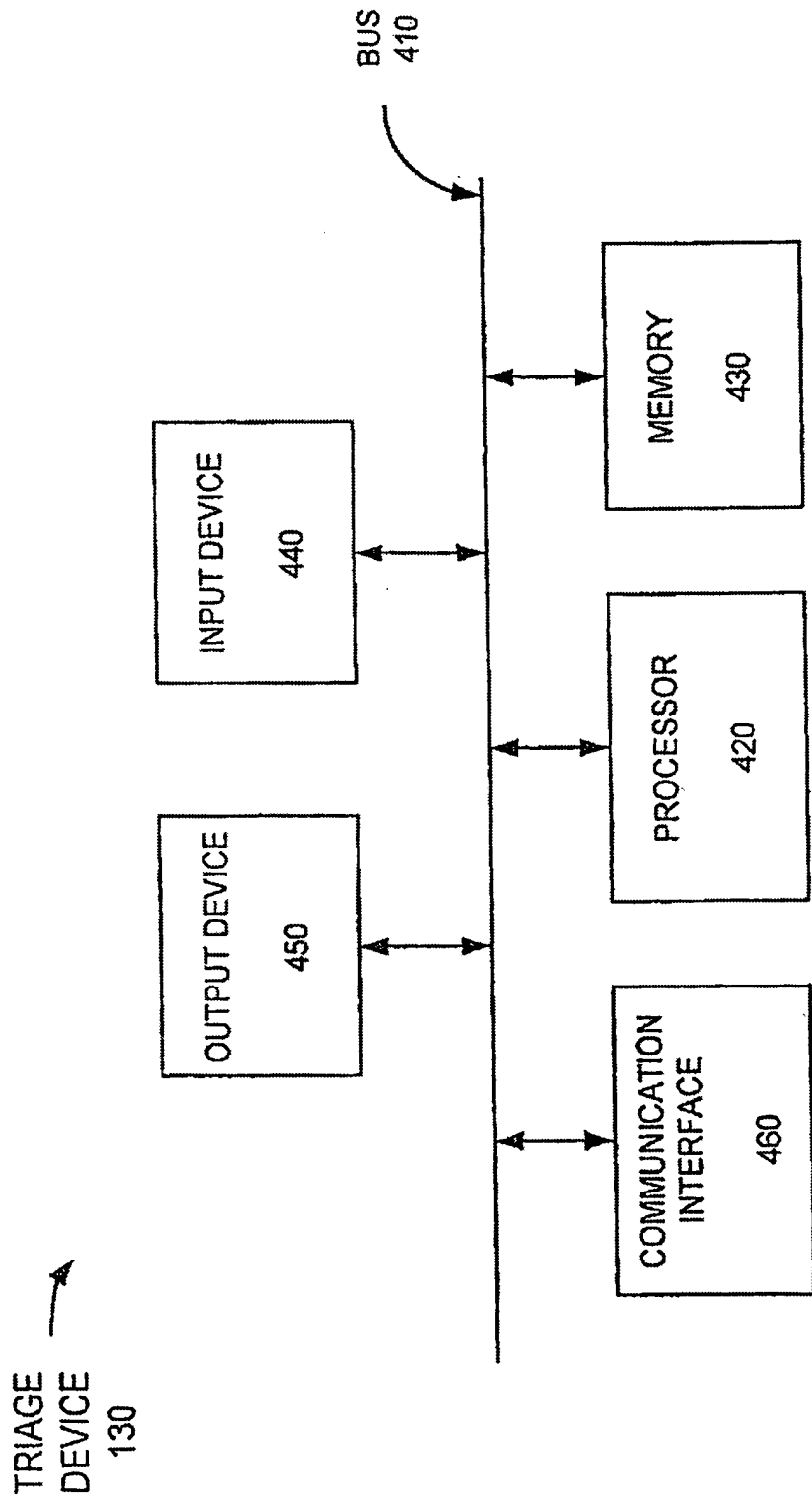


FIG. 4

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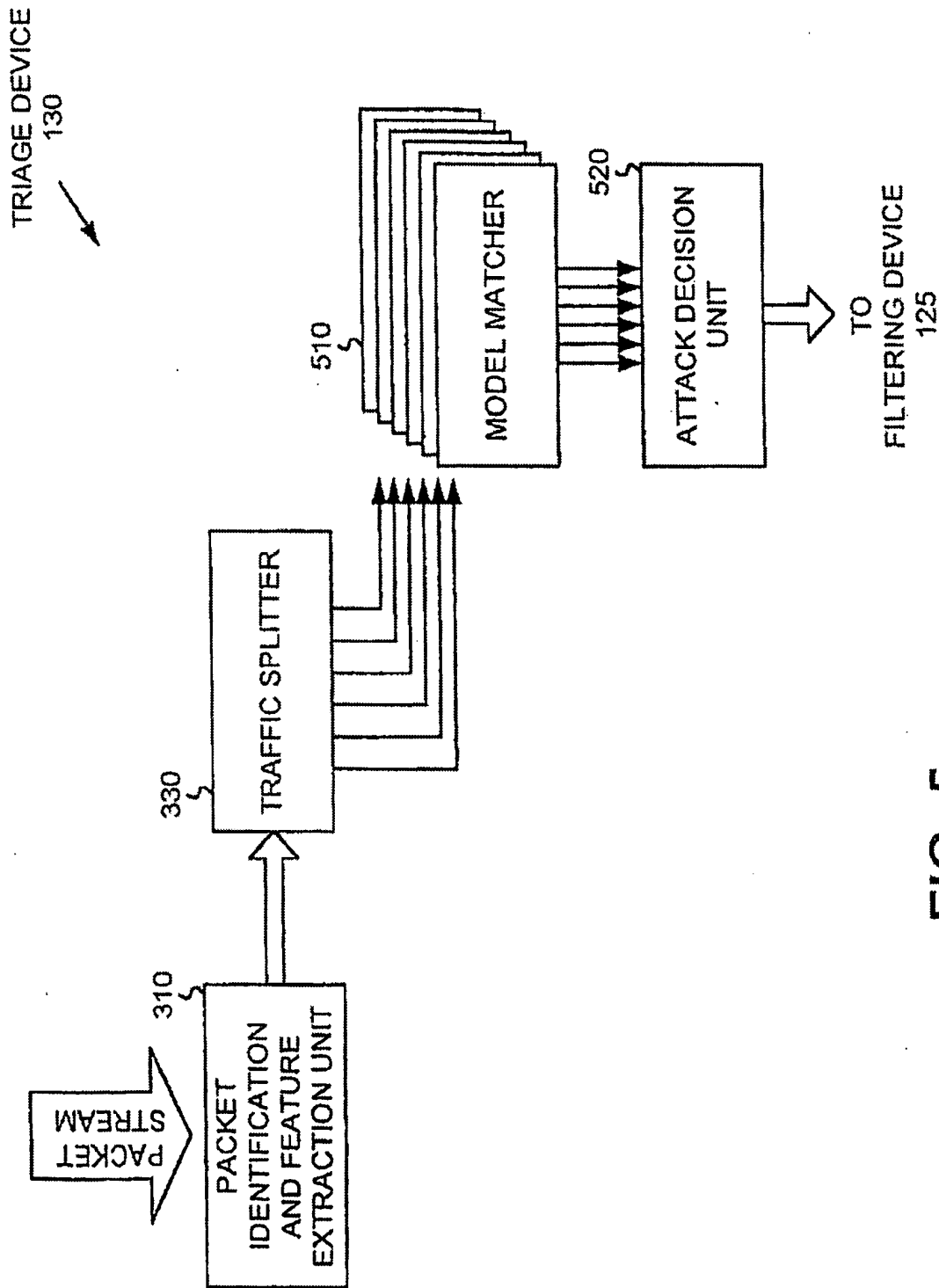


FIG. 5

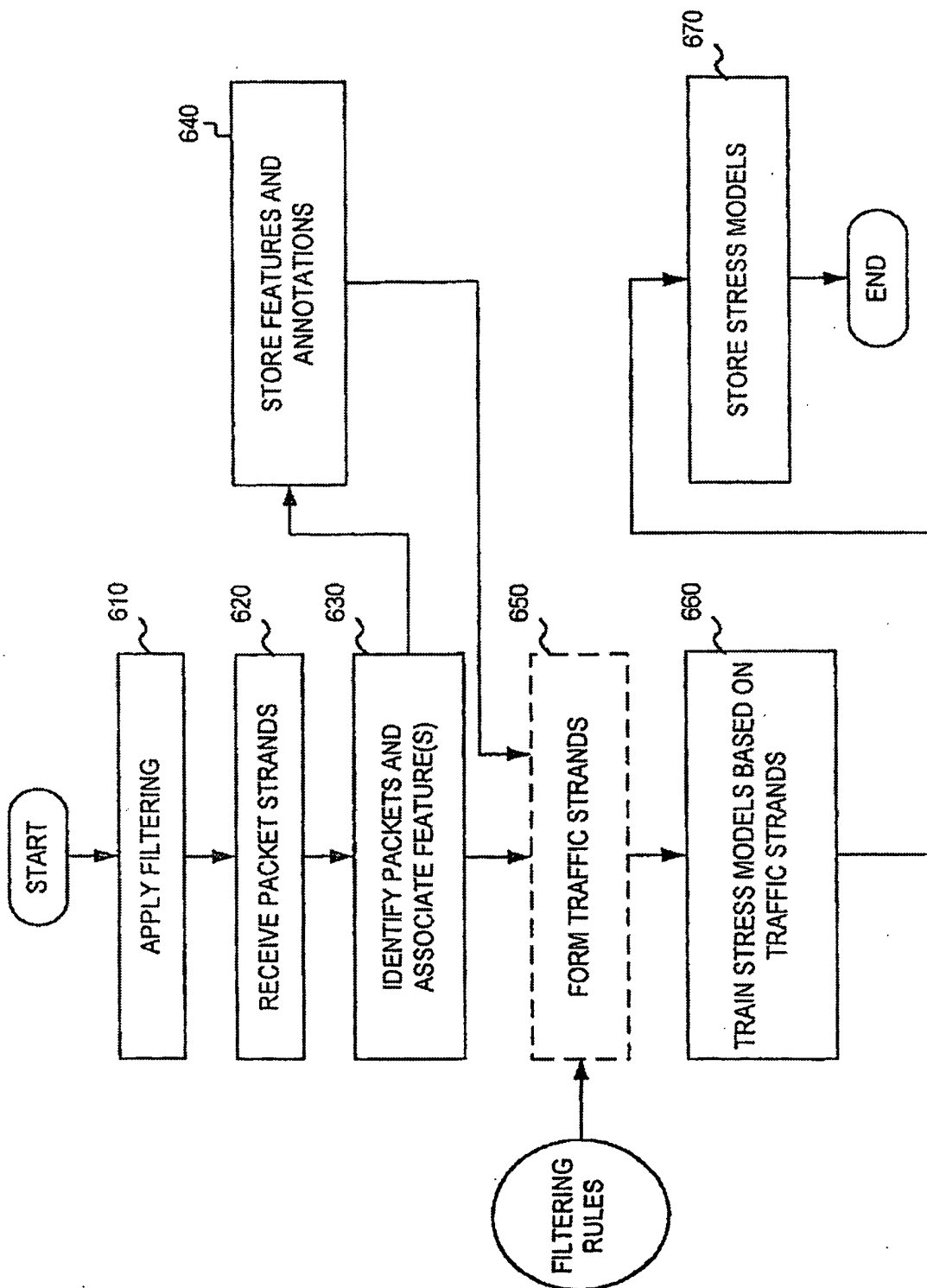


FIG. 6

